

TORREYA

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THE ORIGIN OF SPECIES BY MUTATION*

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The period which has elapsed since the presentation by Darwin and Wallace of the theory of the origin of species by natural selection has been most fruitful in the development of speculations as to the factors of evolution and the methods of inheritance and descent. The diversity of the evidence to be considered in connection with any phase of the subject is enormously great, and the majority of biologists interested in the subject have become engrossed in the argumentative presentation of the particular group of opinions to which they give a more or less prejudiced and partisan adherence after the manner of a debating society. During this period the investigators who most rationally held to the attitude that the methods of the origin of species were to be discovered by an examination of living forms themselves gave their attention to the comparative study of related forms or to tracing the phylogenetic phenomena displayed in the embryonic and juvenile stages of the organism.

Within the last decade the conviction has been growing among both botanists and zoölogists that polemics, the array of recapitulative facts offered by the organism in its younger stages, or the facts of comparative anatomy might not offer any convincing evidence of the manner by which the different species actually have arisen, although the results of these studies have been of enormous value in relation to other problems of biology.

In these latter days the tendency has become marked to rely more and more upon results obtained by experimental methods

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of research : instead of attempting to find an answer ready made for our questions we propound our question and set living things in action and seek our reply in their behavior under conditions which we may vary to suit our interrogation. It is obvious that the only way in which we may determine the method of origin of new species is to observe the formation of a species. The recent work of de Vries dealing with this subject is a record of the notable attempt made by him to obtain information upon the subject in this manner.*

De Vries' observations extend over seventeen years and the first volume of the great book in which his work is described deals with the origin of species by mutation, while the second now in preparation gives consideration solely to the subject of hybrids. According to de Vries species may arise by the following general modes :

1. Progressive species-formation by the construction or acquisition of new qualities.
2. Species-formation without the construction of new qualities, in which three cases may be distinguished.
 - A. Retrogressive species-formation by the lapse or latency of existing qualities, partly atavistic.
 - B. Digressive species-formation by the awakening or energizing of latent characters, partly in the formation of anomalous structures and partly in atavistic phenomena.
 - C. Hybridization.

De Vries assumes that any group of individuals which are independent, self-perpetuating and sufficiently distinct by taxonomic characters to meet the requirements of systematic botany constitutes a species irrespective of origin, and in the consideration of his results the importance of his conclusions is not lessened materially whether the forms with which he has dealt are considered as species or varieties so long as they are shown to consist of distinct and independent individuals capable of transmitting certain characters which are assumed to be constant within the limits of ordinary fluctuating variation.

* De Vries, H. Die Mutationstheorie. Versuche und Beobachtungen über die Entstehung von Arten im Pflanzenreich. I. Die Entstehung der Arten durch Mutation. xii + 648 pp. *Pl.* 1-8 + *f.* 1-181. 1901.

It is needless to say that it would be difficult to undertake any experimental investigations involving the consideration of the status of species without running counter to the convictions and prejudices of a considerable number of systematists. Indeed, but few botanists are prepared to assign specific rank to any individual or group of individuals which have been observed to descend from a group of forms constituting a separate species. A somewhat more considerable number accept self-perpetuating hybrids as species, although it is doubtful whether this attitude may become universal. To this greater majority of systematists then the entire matter of origin of species by sports, single variations, or by mutation is entirely out of court. Single variations or sports are known to occur, however, and new species have suddenly appeared in many well-authenticated instances as the records of the last two hundred years show, and the possibility that many of the commonest forms around us may have originated in this very manner should make even the rashest thoughtful and willing to give the evidence an impartial examination.

It will be of interest to recall the origin of *Chelidonium laciniatum* and *Capsella Heegeri* Solms in this connection, the history of which began nearly three hundred years apart. Sprenger, an apothecary in Heidelberg, discovered in his medicinal garden in which *Chelidonium majus* was cultivated a new form of *Chelidonium* with divided leaves and lacinate petals. Specimens were submitted to a number of botanists at that time to whom it was unknown. The new species was found to be self-sustaining and in repeated cultural tests has shown no tendency to revert to *C. majus*. Furthermore, during the next three centuries it has never been seen except in gardens or in localities where it had clearly escaped from cultivation. Evidence of such conclusiveness would be held worth a human life in criminal proceedings in a court of law. A new species of *Capsella* was found by Professor Heeger at Landau in 1897 which apparently arose from a culture of *Capsella Bursa-pastoris*. This species was so distinct as to be assigned to the genus *Camelina* upon a first examination by Solms-Laubach.* Later, however, its true position was found.

* Solms-Laubach. Crucifereenstudien. Bot. Zeitung, 58 : 167. 1900.

This species has not been found in any collection of herbarium specimens and has not been reported from any other locality. The possibility is not absolutely excluded that the species may not be an old one, or may indeed be a hybrid between *Capsella* and another genus, yet so skilful an observer as Solms is disposed to believe it a new species originating by recent mutation from *C. Bursa-pastoris*. It has been found constant in its characters and self-sustaining so far. Numerous other instances of accidental observation might be cited but it will be profitable to pass at once to the cultural experiments of de Vries.

(To be continued.)

THE ACAULESCENT VIOLETS OF CENTRAL NEW YORK

BY HOMER D. HOUSE

VIOLA PALMATA L. Sp. Pl. 933. 1753.

V. palmata var. a. *vulgaris* Ell. Bot. S. C. & Ga. 1: 300. 1817.

V. palmata var. b. *fragrans* Ell. l. c.

V. cucullata var. *palmata* A. Gray, Man. 28. 1867 [ed. 5].

Not common in central New York. The entire-leaved forms are some seasons more abundant than the forms with palmately divided leaves. The two forms are always found associated in this region. The entire-leaved variety I shall designate as :

Viola palmata asarifolia (Pursh).

V. asarifolia Pursh, Fl. Am. Sept. 732. 1814.

V. palmata sororia Pollard, Bot. Gaz. 26: 332. 1898. Not *V. sororia* Willd. Hort. Berol. 1. pl. 72. 1806. Perhaps *V. sororia* Willd. Enum. 263. 1809, and of Le Conte, Schweinitz, Nuttall, etc.

Mr. C. L. Pollard refers the entire-leaved forms of *Viola palmata* to Willdenow's *V. sororia*. I am not familiar with the reference Mr. Pollard gives to Willdenow's *sororia*, viz., Enum. 263. 1809. I am, however, familiar with his use of the name in